

SOUTH FORK OF HILL CREEK BRIDGE
Texas Historic Bridges Recording Project
Walnut Springs City Park
(Moved from South Fork of Hill Creek at
County Route 2730, Walnut Springs Vicinity)
Walnut Springs
Bosque County
Texas

HAER No. TX-30

HAER
TEX
18-WALSP,
1-

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD

National Park Service
Department of the Interior
1849 C St., NW
Washington, DC 20240

HISTORIC AMERICAN ENGINEERING RECORD

SOUTH FORK OF HILL CREEK BRIDGE

HAER
TEX
18-WALSP
1-

HAER No. TX-30

Location: Walnut Springs City Park, Walnut Springs, Bosque County, Texas.
(Moved from South Fork of Hill Creek at County Route 2730, Walnut Springs vicinity, Bosque County, Texas.)
UTM: 14/620160/3553380.
USGS: Walnut Springs East, Texas, quadrangle (1979).

Date of Construction: Circa 1910.

Designer: Unknown.

Builder: Unknown.

Present Owner: Walnut Springs Lions Club, Walnut Springs, Texas.

Present Use: Out of service.

Significance: The South Fork of Hill Creek Bridge is the only known double-intersection Warren pony truss highway bridge in Texas. In 1995 the bridge was moved to Walnut Springs for eventual reuse as a footbridge across Steeles Creek.

Historian: Mark M. Brown, August 1996. Revised September 1998.

Project Information: This document was prepared as a part of the Texas Historic Bridges Recording Project performed during the summer of 1996 by the Historic American Engineering Record (HAER). The project was sponsored by the Texas Department of Transportation (TxDOT).

I. Description

The South Fork of Hill Creek Bridge, approximately fifty-four feet long and thirteen feet wide, is a riveted double-intersection, three-panel Warren pony truss. The trusses are reinforced with knee braces at the top chord panel points in such a way that they could be mistakenly interpreted from a distance as the verticals of a Howe truss. These braces are apparently not original, however, because they are bolted to the deck stringers and are rather clumsily riveted into the top chord. Two braces are missing and many of the those remaining are twisted out of shape, presumably from automobile collisions. The trusses are about three inches out of parallel and the braces may have been added in a vain effort to address this problem. Until recently, built-up members attached to the inclined posts served as approach guard rails.

The inclined posts and the approximately eight-inch-wide top chords are built of plates and angles into a roughly J-shape, with the short flange of the "J" pointing towards the deck on the inclined posts and away from the deck on the top chord (Figure 1). Most of the remaining details of the two trusses differ to such an extent that the trusses might have been salvaged from different bridges and spliced together: the top chords have one fabrication joint on the west truss and two on the east. End posts on the west truss have gusset plates, but those on the east do not. The diagonals are also fabricated differently: those in the west truss have two angles and a plate, while those in the east truss are built of only two angles with a square gusset plate at their intersection. Repairs, including welds, appear to have been made throughout.

Contrary to usual expectations, the deck has a total of four stringers consisting of both rolled (with taller webbing) and built-up I-beams (with wider flanges). Deck beams are also built-up I-beams. A single Warren pattern was used for the bottom lateral bracing. The entire deck was once encased in concrete.

There is no builder's plate.

II. History

The South Fork of Hill Creek Bridge is the only known double-intersection Warren truss highway bridge in Texas. Very little is known about the structure. Located northeast of Walnut Springs, Bosque County, Texas, the bridge is very near the border with Somervell County.

In 1890 the Bosque County Commissioners' Court reorganized the existing county road system and in doing so established a second-class road "from Hill Creek to Morgan Road to follow the road bed" of an existing road between Morgan, southeast of Walnut Springs, and Glen Rose, the county seat of Somervell County. No further reference to this road, to the South Fork crossing, or to any bridge thereon has been found in the county records.¹

A local tradition about the original construction of the bridge is given circumstantial support by the general construction of the bridge itself. The internally statically indeterminate

¹ Bosque County, *Commissioners' Court Minutes*, vol. E (Bosque County Courthouse, Meridian, Texas), p. 148 (February 12, 1890).

truss type,² the riveted connections, and the overall weight of the members suggests a construction date in the 1910s. Such a date would not be entirely inconsistent with efforts to construct an interurban railway in the region. The scheme to connect Waco, Meridian, and Walnut Springs with Glen Rose was initially proposed around 1905. Sections of the right-of-way were constructed in the Walnut Springs area before the project collapsed in the mid-1910s. It may be that the South Fork Bridge was intended for the interurban line and that the existing road was diverted from a ford just upstream to the bridge at that time. Examination of the topographic map for evidence of the types of features typical of railroad rights-of-way appears inconclusive.³

² Based on the discussion in Jack C. McCormac, *Structural Analysis*, 3rd ed. (New York: Harper and Row, 1975), pp. 115-18, a double-intersection Warren truss is statically indeterminate internally. McCormac states that

the relationship that must exist between the number of joints and the number of members and reaction components for a particular truss if it is to be statically determinant internally

is $m = 2j - r$, where " m is the number of members, j is the number of joints, and r is the number of reaction components" (p. 115). For the South Fork of Hill Creek Bridge $m = 26$, $j = 13$, and $r = 3$. Applying the formula, this becomes $26 > (2 \times 13) - 3$ or $26 > 23$.

McCormac observes:

It is possible to build trusses that have too many members to be analyzed by statics, in which case they are statically indeterminate internally, and m will exceed $2j - r$ because there are more members present than are absolutely necessary for stability. The extra members are said to be redundant members. If m is three greater than unifies $2j - r$, there are three redundant members, and the truss is internally statically indeterminate to the third degree. Should m be less than $2j - r$, there are not enough members present for stability. (p. 116)

At South Fork, the redundant members are those which make the bridge a double intersection (as opposed to the common single intersection) Warren truss. Special thanks to Norman Friedman, P.E., Design Division, TxDOT, for his explanations of this concept.

In the nineteenth century, American engineers avoided statically indeterminate truss types because it made for easier design calculations. The extensive use of pins instead of riveted connections at the panel points of most nineteenth century American bridges is an example of this preference.

³ Bennett Morrow, Justice of the Peace, Walnut Springs, Texas, personal conversation, June 19, 1996. Former Commissioner Pete Page, who claims responsibility for concreting the deck, relayed the view to Judge Morrow that the bridge was reused from the interurban. On the

At some point in recent decades, the bridge was given a concrete deck. In 1995 the bridge was removed to Walnut Springs City Park for eventual reuse as a footbridge across Steeles Creek.

interurban see Bryan E. Sowell, *Texas Central Headquarters: Walnut Springs* (Waco, Texas: self-published, 1984), pp. 254-55.

SOURCES CONSULTED

Bosque County, Texas. *Commissioners' Court Minutes*. Bosque County Courthouse, Meridian, Texas.

McCormac, Jack C. *Structural Analysis*, 3rd ed. New York: Harper and Row, 1975.

Morrow, Bennett. Personal conversation, June 19, 1996.

Sowell, Bryan E. *Texas Central Headquarters: Walnut Springs*. Waco, Texas: self-published, 1984.

APPENDIX A: Suggestions for Further Research

This recording project has raised several issues that remain unanswered due to limitations of time and resources. It is not clear, however, whether additional research would be likely to uncover more information about the date, builder, or circumstances surrounding the construction and repair of this bridge. It might be profitable to obtain more specific dimensions of the bridge. Inquiries at the TxDOT district office in Waco indicated that bridge inspection files, which often contain a sketch and a member schedule, were not retained after the bridge was moved.

APPENDIX B: Schematic Cross-Section of Top Chords and End Posts (not to scale).

